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10/562,438	12/28/2005	Kaoru Inoue	043888-0428	3628

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EXAMINER	
LEWIS, BEN	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,438	INOUE ET AL.	
	Examiner	Art Unit	
	Ben Lewis	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,11-15 and 18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,11-15 and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/1/06*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 15 and 18 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Applicant has not disclosed how to make or use the invention. It would be undue experimentation for one of ordinary skill in the art to make the invention. There is no teaching of how the Applicant is capable excluding the effect of the porosity of the adjacent electrode and porous insulating film when measuring the void size distribution of the adhering interface of the electrode and porous insulating film by a mercury intrusion porosimeter.

Furthermore, it is not clear how one of ordinary skill in the art would be able to practice the instant invention since it lacks steps or working examples needed to exclude the effect of the porosity of the adjacent electrode and porous insulating film when measuring the void size distribution of the adhering interface of the electrode and porous insulating film by a mercury intrusion porosimeter.

Factors to be considered in determining whether the claimed invention would require undue experimentation are given in MPEP 2164.01 (a). In re Wands, 858 F. 2d 731; 8 USPQ 2d 1400, 1404 (Fed. Cir. 1988). Only the relevant factors will be addressed for determining undue experimentation of the presently claimed invention. The relevant factors are (A) Breadth of the claims; (B) The amount of direction provided by the inventor, (C) The existence of working examples, and (D) The quantity of experimentation needed to make or use the invention based on the content of the disclosure.

Factor (A) Breadth of the claims:

No guidance is given in the specification of how to exclude the effect of the porosity of the adjacent electrode and porous insulating film when measuring the void size distribution of the adhering interface of the electrode and porous insulating film by a mercury intrusion porosimeter.

It would be undue experimentation to one of ordinary skill in the art to determine how to exclude the effect of the porosity of the adjacent electrode and porous insulating film when measuring the void size distribution of the adhering interface of the electrode and porous insulating film by a mercury intrusion porosimeter.

Factor (B) The amount of direction provided by the inventor.

Applicant only gives numerous examples of the pore size distributions of the negative electrode and porous insulating films determined by mercury intrusion porosimeter.

Factor (C) The existence of working examples:

This factor has been addressed by factor (B) above.

Factor (D) The quantity of experimentation needed to make or use the invention based on the content of the disclosure.

This factor has been addressed by factor (A) above.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 1 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. (Japanese Pub. No. 09-147916) in view of Yukita et al. (U.S. Patent No. 5,705,292)

With respect to claim 1, Inoue et al. disclose a nonaqueous electrolyte secondary battery (title) wherein,

With respect to the porous insulating layer Inoue et al. teach that the surface of the negative electrode is coated with a coating consisting of 3% carboxy methyl cellulose "film binder" and 97% alpha-aluminum "inorganic oxide filler" (Paragraph 0060).

With respect to the separator Inoue et al. teach that fine porosity polypropylene film separator is applied to the coated negative electrode sheet (Paragraph 0060).

With respect to the porosity of the separator Inoue et al. teach that the separator has a porosity of 20% to 90% (Paragraph 0045).

Inoue et al. do not specifically teach the porosity of the electrode coating "porous insulating film". However, Yukita et al. disclose a lithium ion secondary battery (title) wherein in the first embodiment, as shown in FIG. 1A, a sprayed film, i.e., a heat-resistant and heat-insulating film 20 "porous insulating film" is formed by spraying, e.g, plasma-spraying a ceramic powder of alumina (Al_2O_3) having a mean particle size of 20 μm on both surfaces of the positive-electrode mixtures 4 deposited on the positive electrode 2 (Col 4 lines 9-15). Yukita et al. also teach that accordingly, the sprayed film has a structure similar to that of the porous sintered body (having a porosity ranging from about 0 to 20%) having micropores formed by combining the sprayed particles. As

a result, it is possible to obtain a film having an ion permeability and resistance to heat higher than 1000 °C (Col 4 lines 45-55). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the porosity of Yukita et al. in the making of the electrode coating “porous insulating film” of Inoue et al. because Yukita et al. teach that having a porosity of 0 to 20% is necessary to obtain ion permeability.

With respect to the relationship between R and P, Inoue et al. teach an R of 0.5 when porosity of the separator is 0.5. Yukita et al. teach a porous insulating film porosity of 0.2. Then R-P = 0.3 which satisfies -0.10 <= R-P <= 0.30.

With respect to claim 11, Inoue et al. teach that the porous insulating layer Inoue et al. teach that the surface of the negative electrode is coated with a coating consisting of 3% carboxy methyl cellulose “film binder” and 97% alpha-aluminum “inorganic oxide filler” (Paragraph 0060).

5. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. (Japanese Pub. No. 09-147916) in view of Yukita et al. (U.S. Patent No. 5,705,292) and further in view of Shinohara et al. (U.S. Pub. No. 2002/0055036 A1).

With respect to claim 12, Inoue et al. disclose a nonaqueous electrolyte secondary battery (title) wherein,

With respect to the porous insulating layer Inoue et al. teach that the surface of the negative electrode is coated with a coating consisting of 3% carboxy methyl

cellulose "film binder" and 97% alpha-aluminum "inorganic oxide filler" (Paragraph 0060).

With respect to the separator Inoue et al. teach that fine porosity polypropylene film separator is applied to the coated negative electrode sheet (Paragraph 0060).

With respect to the porosity of the separator Inoue et al. teach that the separator has a porosity of 20% to 90% (Paragraph 0045).

Inoue et al. do not specifically teach the porosity of the electrode coating. However, Yukita et al. disclose a lithium ion secondary battery (title) wherein in the first embodiment, as shown in FIG. 1A, a sprayed film, i.e., a heat-resistant and heat-insulating film 20 "porous insulating film" is formed by spraying, e.g, plasma-spraying a ceramic powder of alumina ($Al_2 O_3$) having a mean particle size of 20 μm on both surfaces of the positive-electrode mixtures 4 deposited on the positive electrode 2 (Col 4 lines 9-15). Yukita et al. also teach that accordingly, the sprayed film has a structure similar to that of the porous sintered body (having a porosity ranging from about 0 to 20%) having micropores formed by combining the sprayed particles. As a result, it is possible to obtain a film having an ion permeability and resistance to heat higher than 1000 °C (Col 4 lines 45-55). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the porosity of Yukita et al. in the making of the electrode coating "porous insulating film" of Inoue et al. because Yukita et al. teach that having a porosity of 0 to 20% is necessary to obtain ion permeability.

With respect to polycrystalline particles, the inorganic filler particles of Yukita et al. are not perfectly smooth which reads on any particle that is comprised of primary particles.

Inoue et al. as modified by Yukita et al. do not specifically teach that the pore size distribution of the porous insulating film is not less than 0.15μm. However, Shinohara et al. disclose a separator for non-aqueous electrolyte secondary battery (title) wherein, either of the heat-resistant porous layer, the shut-down layer and the spacer may contain an inorganic compound. The inorganic compound contained in a spacer may be just a high order metal oxide having an electrochemical-oxidation resistance, and inactive to an electrolyte. As a concrete example, although aluminum oxide, calcium carbonate, silica, etc. are exemplified, the present invention is not limited to these (Paragraph 0040). Shinohara et al. teach that the pore size or pore diameter of the above-mentioned heat-resistant porous layer "porous insulating film", is suitably 3 μm or less, and more suitably 1 μm or less. If the average pore size or pore diameter exceeds 3 μm, a problem of short circuit may easily occur when the carbon powder or the bit which is the main component of a cathode or an anode drops out (Paragraph 0020). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the pore size of Shinohara et al. into the porous insulating film of Inoue et al. as modified by Yukita et al because Shinohara et al. teach that having a porosity less than 3 μm "which is within the range claimed by Applicant" prevents short circuiting.

With respect to the inorganic filler particles being polycrystalline, Inoue et al. as modified by Yukita et al. and Shinohara et al. do specifically mention that the inorganic oxide filler particles are polycrystalline. The instant specification teach that from the viewpoint of providing a porous insulating film having high thermal resistance, it is desirable that the inorganic oxide filler have a thermal resistance of not less than 250 °C, and that the inorganic oxide filler be electrochemically stable in the potential window of non-aqueous electrolyte secondary batteries. Although many inorganic oxide fillers satisfy these conditions, among inorganic oxides, preferred are alumina, silica, zirconia, titania. Particularly preferred are alumina and titania. The inorganic oxide fillers may be used singly or in any combination of two or more (Paragraph 0038).

Inoue et al. teach that the surface of the negative electrode is coated with a coating consisting of 3% carboxy methyl cellulose "film binder" and 97% alpha-aluminum "inorganic oxide filler" (Paragraph 0060). Therefore, it is the position of the examiner that the insulating film paticles of Inuoe et al. are inherently polycrystalline, given that Inoue et al. as modified by Yukita et al. and Shinohara et al. and the present application utilize same inorganic filler particle material. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. In re Robertson, 49 USPQ2d 1949 (1999).

With respect to claim 12, this claim is a product by process claims. The reaction diffusion bonding of primary particles, do not further limit the product of claim 1. MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F. 2d 698,227 USPQ 964,966 (Fed Cir. 1985).

6. Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. (Japanese Pub. No. 09-147916) in view of Yukita et al. (U.S. Patent No. 5,705,292) and Shinohara et al. (U.S. Pub. No. 2002/0055036 A1) and further in view of Akashi (Japanese Pub. No. 2004-010701.

With respect to claims 13-14, Inoue et al. as modified by Yukita et al. and Shinohara et al. disclose a battery separator in paragraph 5 above. Inoue et al. as modified by Yukita et al. and Shinohara et al. do not specifically teach wherein the average primary particle size is not greater than 10μm. However, Akashi discloses a polyolefin membrane (title) wherein the membrane contains inorganic oxide particles of oxidization silicon, alumina and titanium oxide (Paragraph 0013). Akashi teaches that the particle the diameter of the inorganic oxide filler is 100nm (0.1μm) or less (Paragraph 0013). Akashi teach that if the particle size exceeds 100nm, the reinforcement of the polyolefine film to which the particle was added would become less

(Paragraph 0012). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the particle size of inorganic filler of Akashi into the separator of Inoue et al. as modified by Yukita et al. and Shinohara et al. because Akashi teach that if the particle size exceeds 100nm, the reinforcement of the polyolefine film to which the particle was added would become less (Paragraph 0012).

With respect to claims 13-14, Applicant also states in paragraph 48 of the instant application that it may be the case that the primary particles cannot be clearly defined in the polycrystalline particles. The instant specification teach that the primary particles forming the polycrystalline particles desirably have an average particle size of not greater than 3 μm, more preferably not greater than 1 μm. When the primary particles have an average particle size of exceeding 3 μm, the amount of the film binder will be excess as the surface area of the filler is decreased, and the swelling of the porous insulating film due to the non-aqueous electrolyte might easily occur. In the case where the primary particles cannot be identified clearly in the polycrystalline particles, the particle size of the primary particles is defined by the thickest part of a knot of the individual polycrystalline particles (Paragraph 0048).

Thus if the limitations regarding diffusion-bonded is regarded as a **product-by process limitation,** then the inorganic oxide of the prior art having a particle size not greater than 10 microns meets claim 12-14 since the inorganic oxide filler in the prior art inherently is not perfectly round and smooth and may have bumps.

7. Claims 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. (Japanese Pub. No. 09-147916) in view of Ota et al. (U.S. Patent No. 6,365,300 B1)

With respect to claim 1, Inoue et al. disclose a nonaqueous electrolyte secondary battery (title) wherein,

With respect to the porous insulating layer Inoue et al. teach that the surface of the negative electrode is coated with a coating consisting of 3% carboxy methyl cellulose "film binder" and 97% alpha-aluminum "inorganic oxide filler" (Paragraph 0060).

With respect to the separator Inoue et al. teach that fine porosity polypropylene film separator is applied to the coated negative electrode sheet (Paragraph 0060).

With respect to the porosity of the separator Inoue et al. teach that the separator has a porosity of 20% to 90% (Paragraph 0045).

Inoue et al. do not specifically teach the roughness of the surface of the electrode. However, Ota et al. discloses a lithium secondary battery (title) wherein, the surface roughness (Rmax) of the negative electrode, also, affects the battery performance considerably. It is desirable that the value of Rmax be not less than 0.01μm and not more than 5μm. If less than 0.01μm good bonding with the electrolytic layer cannot be obtained, resulting in easy separation (Col 10 lines 1-15). Therefore it would have been obvious to use the roughness values of Ota et al. in manufacturing the electrodes of Inoue et al. because Ota et al. teach that an electrode roughness of

0.01μm and not more than 5μm results in good bonding of the electrolyte layer (Col 10 lines 1-15).

With respect to the void size distribution of said adhering interface having a peak in a region ranging from 1μm to 4μm. The instant specification recites that in order to form a void having a size of 1 to 4 μm on the adhering interface, desirably, the surface roughness of the electrode surface to which the porous insulating film is adhered is appropriately adjusted. Specifically, the average value Ra of the surface roughness of the electrode surface measured by a surface roughness measuring instrument is desirably 0.1 to 1 μm more desirably 0.2 to 0.8 μm. When the Ra is less than 0.1 μm, the electrode surface serving as the base for the porous insulating film will be excessively smooth, and it might be difficult to form a void having a size of 1 μm or greater on the adhering interface. Conversely, when the Ra exceeds 1 μm, the electrode surface serving as the base will be excessively nonuniform and the adhering area between the electrode surface and the porous insulating film will be excessively small, and it might be difficult to form a void having a size of 4 μm or less on the adhering interface (Paragraph 0063).

Inoue et al. as modified by Ota et al. teach that the surface roughness (Rmax) of the negative electrode, also, affects the battery performance considerably. It is desirable that the value of Rmax be not less than 0.01μm and not more than 5μm. If less than 0.01μm good bonding with the electrolytic layer cannot be obtained, resulting in easy separation (Col 10 lines 1-15).

Inoue et al. as modified by Ota et al. do not disclose any void size distribution data of the adhering interface. However, it is the position of the examiner that such properties are inherent, given that Inoue et al. as modified by Ota et al. and the present application utilize same insulative film on an electrode surface with the same roughness. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. In re Robertson, 49 USPQ2d 1949 (1999).

With respect to claim 18, Inoue et al. teach that the porous insulating layer Inoue et al. teach that the surface of the negative electrode is coated with a coating consisting of 3% carboxy methyl cellulose "film binder" and 97% alpha-aluminum "inorganic oxide filler" (Paragraph 0060).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben Lewis whose telephone number is 571-272-6481. The examiner can normally be reached on 8:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-.9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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